ACKERLY CREEK BRIDGE
South Turnpike Road (S.R. 4011)
Dalton
Lackawanna County
Pennsylvania

HAER No. PA-407

HAER
PA
35-DALT,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, P.A. 19106

HISTORIC AMERICAN ENGINEERING RECORD

ACKERLY CREEK BRIDGE

HAER No. PA-407

HAER
PA
35-DALT,
1-

Location:	South Turnpike Road (S.R. 4011) Dalton Lackawanna County, Pennsylvania UTM: 18.438645.4597550 Quad: Dalton, Pennsylvania, 1:24,000
Date of Construction:	1904; 1929
Engineer:	Not known
Fabricator:	Not known
Owner:	Commonwealth of Pennsylvania Department of Transportation Transportation and Safety Building Harrisburg, Pennsylvania 17120
Present Use:	Vehicular bridge
Significance:	Ackerly Creek Bridge, originally constructed in 1904 and partially rebuilt in 1929, is an early Pennsylvania example of a reinforced concrete, single span, arched vehicular bridge.
Project Information:	Pennsylvania Department of Transportation evaluations have indicated that the bridge is structurally deficient due to major deterioration of most concrete members. In several areas, reinforcing bars are exposed and are deteriorating. In addition, the skew of the bridge and the angles of the approach road limit sight distances. Rehabilitation of the bridge has been determined unfeasible. To mitigate the adverse effect of demolition, a Memorandum of Agreement (MOA) was executed among the Federal Highway Administration, the Pennsylvania Department of Transportation, and the Pennsylvania State Historic Preservation Officer. The MOA stipulates that the existing bridge be recorded to standards of the Historic American Engineering Record.
Documentation:	Richard Meyer/Senior Project Manager Douglas C. McVarish/Project Architectural Historian John Milner Associates, Inc. 309 North Matlack Street West Chester, Pennsylvania 19380

DESCRIPTION OF BRIDGE AND SETTING

Ackerly Creek Bridge carries S.R. 4011, known locally as South Turnpike Road, over Ackerly Creek. The source of Ackerly Creek is a marsh, located approximately 5.49km (3.41 mi.) east of the bridge in South Abington Township south of S.R. 0632. The creek flows northwest to join the South Branch of Tunkhannock Creek near the Lackawanna-Wyoming county line. The bridge is located at a bend in the road, approximately 610.0m (2,000 ft.) south of the S.R. 4011 and S.R. 0632 intersection in the center of Dalton. The surrounding land use is primarily residential. Northwest of the bridge is an overgrown lot with a house beyond. Southwest of the bridge is a vacant, wood-framed structure, originally used as a barn and later used as a residence. Northeast of the bridge is an overgrown lot containing a wood-framed, mid-nineteenth century house, while east of the bridge is a recently constructed house on a large lot.

Ackerly Creek Bridge is a single span, concrete arched structure, measuring 12.35m (40 ft., 6 in.) in length and 7.85m (25 ft., 9 in.) in width. The creek flows southeast to northwest beneath the bridge. The bridge has a segmental, barrel vaulted arch with a clear span of 10.22m (33 ft., 6 in.) and a maximum clearance of 1.68m (5 ft., 6 in.) above the water surface. The arch is constructed of reinforced concrete. Examination of its surface reveals extensive severe spalling that has exposed reinforcing bars to the elements and has distorted the arch's curvature. Additional spalling is evident on the smooth-finished spandrel wall. The approximate roadway width is 7.32m (24 ft.). The deck is constructed of reinforced concrete with a .15m (6 in.) bituminous wearing surface.

Form-poured concrete abutments extend along the banks of the creek and anchor the bridge to its site. The northeast abutment meets the bridge at a 40 degree angle. The southeast abutment, which meets the bridge at a 45 degree angle, extends 2.14m (7 ft.) along the bank. The southwest abutment, which also meets the bridge at a 45 degree angle, extends .84m (2 ft., 8 in.) along the bank, while the northwest abutment, which meets the bridge at a 30 degree angle, extends 1.83m (6 ft.) along the bank. A .12m (5 in.) diameter iron pipe carries a gas line between the northeast and southeast abutments. Stone slabs on the south bank of the creek west of the bridge provide evidence of an abutment from an earlier structure.

The bridge has solid, reinforced concrete parapets. Because of the orientation of the bridge, these parapets are skewed in relation to each other, the west parapet extending further north than the east parapet. Each parapet is divided into three sections, and the inner wall of each section has a central recessed panel and square end posts. The parapets are topped by rectangular concrete railings, measuring approximately .23m (9 in.) in width. The central section of each parapet has a gently curving top surface; its recessed panel follows the curve of the top surface. The outside sections of the parapets measure approximately 1.07m (3 ft., 6 in.) in height. The end posts measure approximately .20m (8 in.) square and are topped with beveled square caps. Concrete curbs angle outwardly from the lower portion of the inner faces of the parapet walls. Substantial portions of these curbs have spalled. The outer faces of the parapets lack recessed panels. A projecting beveled concrete band divides the parapet from the spandrel wall. Both parapets have spalled extensively, most noticeably at tbe end posts.

At the midpoint of each parapet is a beveled concrete panel in the shape of a keystone. A shield-shaped plaque, fabricated from bronze, is mounted within the east panel. The text reads:

> Erected by Lackawanna County 1904. Victor Burschel, John J. Durkin, John Penman, County Commissioners. County Surveyor. No. 2 of 1902.

A keystone shaped plaque, also fabricated from bronze, is mounted within the west panel. The text reads:

> Erected by Lackawanna, Co. 1929. Morgan Thomas, L. H. Vonbergen, John F. Healey, Commissioners. Irving Lewis, Chief Clerk. Wm. G. Watkins, Controller. F. O. Stone, Surveyor.

BACKGROUND HISTORY

Stone Arch Bridges

The technology of concrete arch construction developed from the earlier technology of stone arch construction. Stone arch bridges, first built by the Etruscans and the Romans (Condit 1961a:240), were introduced in North America during the colonial period. The earliest known stone bridge in the United States that still carries a modern highway is Philadelphia's Frankford Avenue Bridge over Pennypack Creek. This bridge was erected in 1697 as part of the King's Road (Commonwealth 1986:43).

As a building material, stone has substantial compression strength but lacks tensile strength. As a result, stone bridges were generally constructed with semi-circular or segmentally curved arches (Commonwealth 1986:34, 157). Construction of stone arches was time-consuming and labor intensive. A stone arch bridge required the expertise of a skilled stone mason and workers competent in both laying stone and producing a mortar mix that would maximize the strength of the structure. Because of cost, time, and the shortage of skilled craftsmen (Schodek 1987:72), other materials supplanted stone as the predominant bridge building materials in the United States.

Concrete Arch Bridges

Among the materials that supplanted stone was concrete. While concrete has high compression strength (McCormac 1978:1), it also has a low tensile strength. The tensile strength of concrete can be substantially increased with steel reinforcing. The development of steel reinforcing permitted the construction of concrete bridges with long span length. After the perfection of this technology, concrete became the favored material for masonry bridges. A reinforced concrete bridge could generally be erected more rapidly than a stone bridge of the same length. Although technical expertise is required to insure that the concrete is mixed and cured properly, fewer skilled workers are required to erect a concrete arch bridge than are required to erect a stone arch bridge.

The technology of reinforced concrete arches was largely developed by French theorists and inventors and Swiss engineers. By 1885 the French had constructed small reinforced arches in which wire mesh reinforcing was imbedded in the concrete and bent in a curved surface, approximating the undersurface of the arch. By 1890, using this technology, the Swiss had built at least three reinforced concrete arch bridges with spans exceeding 36.6m (120 ft.) (Condit 1961a:247-248).

The first concrete arch bridge built in the United States was the Cleft Ridge Span, erected in Prospect Park, Brooklyn, New York in 1871. This bridge lacked reinforcing (Commonwealth 1986:11). The first application of European reinforced concrete arch technology in bridge construction in the United States occurred in 1889. In that year Ernest L. Ransome built a reinforced concrete arch bridge, the Alvord Lake Bridge in Golden Gate Park, San Francisco, California. The bridge, which still stands, is more nearly a vault than an arch. Its span is 6.1m (20 ft.), and its overall width is 19.52m (64 ft.). Its reinforcing consists of a series of twisted iron bars, imbedded longitudinally in the bridge soffit (Condit 1961a:248-249). Typical of early concrete arch bridges, the surfaces of the span were finished to resemble quarry-faced stone blocks.

The first reinforced concrete arch bridge in the eastern United States was constructed in 1893-1894 to carry Pine Road over the Pennypack Creek in Philadelphia. The bridge consisted of two arches, each with a span of 7.75m (25 feet 5 inches). The reinforcing consisted of sheets of half-inch wire mesh. These sheets were spaced in the horizontal and vertical planes of the concrete at intervals of two feet. The surface of the bridge was finished to imitate rough-textured stone (Conduit 1961a:249).

The popularization of reinforced concrete as a bridge material in the United States followed the introduction of a method of reinforcement invented by Viennese engineer Joseph Melan. This technique combined two different systems of arch construction. Reinforcing consisted of a series of parallel iron or steel I-beams, curved to the profile of the soffit. Melan's technique effectively combined the use of the arch rib with the masonry arch. The first bridge in the United States to employ the Melan reinforcing system was a small span in Rock Rapids, Iowa. Designed by Fritz von Emperger, this bridge was constructed in 1894. Because the Melan system made inefficient use of reinforcement in reducing sheer stresses, the original system was used only for a small number of bridges (Jackson 1989:228). Improvements to the Melan system were undertaken to reduce the amount of reinforcement needed and to increase the stability of the reinforced structure.

In 1898, F. W. Patterson, an engineer for the Department of Public Roads of Allegheny County, Pennsylvania, began to design small highway bridges in which he introduced modifications of the Melan system. One modification was to replace the single barrel arch with two or more separate parallel concrete ribs, each with its own steel reinforcing beam. Another was to form the bridge deck from a series of small arches between steel beams, a technique similar to that employed in concrete floor construction of steel-framed buildings. A final modification expanded on the system of deck reinforcing. Two I-beams were added on either side of the deck, and concrete girders were poured around the beams. This system eliminated the arch entirely and was the prototype for the modern concrete span bridge (Condit 1961a:253).

Techniques of concrete arch bridge construction in the United States have changed little since the late nineteenth century (Condit 1961b:195). Although the Melan system of bridge reinforcing has not been totally abandoned, its reliance on heavy steel ribs or beams has proved to be unnecessary for most bridges. Instead, most barrel arch bridges are reinforced with steel rods (Condit 1961a:253). Typically the rods are first placed in a framework, and the concrete is mixed wet and worked under the bars. The arch ring for the typical concrete arch bridge is built in a series of transverse sections, each setting constituting one continuous operation (Ketchum 1908:371). Ackerly Creek Bridge contains a barrel arch reinforced with steel rods.

Ackerly Creek Bridge

South Turnpike Road, the road on which the Ackerly Creek Bridge is located, was constructed as part of the Factoryville and Abington Turnpike, completed in 1856. The turnpike, a plank road that extended from Wyoming County to north of Scranton in Lackawanna County, formed part of a network of improved roads that knit together hamlets of northeastern Pennsylvania. Other toll roads in the area included the Philadelphia and Great Bend Turnpike, which intersected the Factoryville-Abington Turnpike at the latter highway's terminus in North Chinchilla, and the Abington and Waterford Turnpike, which extended from Clarks Green [present Clark's Summit] to Montrose, Susquehanna County. The Abington and Waterford Turnpike intersected the Factoryville-Abington Turnpike at the center of Bailey Hollow [present Dalton] (Brauer 1988:12-14).

Twelve years after its construction, the original, poorly built Factoryville and Abington Turnpike was replaced with a better built and maintained road. The turnpike provided a route connecting Factoryville with Dalton, Glenburn, and Clarks Summit. One tollgate was located at the north end of Dalton. The road remained in private hands until 1900, when it was condemned by Lackawanna County and opened as a public road (Lackawanna County Road Dockets 4:68).

In 1902, a major flood hit Dalton and much of the rest of Lackawanna County. County road dockets provide evidence of the many bridges that were destroyed as a result of the flood. In Dalton, the rain caused the dam of Glenburn Pond to burst, and the resulting wave of water destroyed a previous bridge on the site (Brauer 1992). The present bridge was constructed to replace the destroyed structure.

The former turnpike, later known as Turnpike Road, was paved in 1910 (Brauer 1988:83). Until the second decade of the twentieth century, Turnpike Road was the major north-south thoroughfare through Dalton. This changed in 1913 when the Delaware, Lackawanna and Western Railroad built a cut-off, which relocated their rail bed between Clarks Summit and Hallstead. The cut-off reduced the track distance between the two points from 69.51km (43.2 mi.) to 63.72 km (39.6 mi.), reduced the grade, and eliminated many dangerous curves. The rail bed, which had been located a short distance west of Turnpike Road, was relocated east of Dalton. Title to the land was transferred to the state, and a new highway, originally known as the Lackawanna Trail and presently known as U.S. Route 6/11, was built on the ridge (Brauer 1988:83). This new highway, unlike the Turnpike Road, bypassed Dalton and several other communities and became the preferred route for long distance travel.

Although no longer the area's major north-south thoroughfare, Turnpike Road continued to be used for local traffic. The bridge may have been damaged in a June 18, 1922 flood that caused extensive damage in Dalton (Brauer 1989:139). Records are lacking concerning specific damage. Another possibility, suggested by local historian Norman Brauer, is that the concrete in one parapet wall deteriorated over time, due either to normal weathering or improper construction (Brauer 1992). In either case, damage to the east parapet resulted in its 1929 replacement. This replacement is documented by the plaque mounted on the parapet.

SOURCES OF INFORMATION/BIBLIOGRAPHY

Interviews

Norman Brauer. October 13, 1992. Dalton, Pennsylvania. Telephone interview. Local historian.

Bibliography

Primary and Unpublished Sources

Lackawanna County Road Dockets. On file in the Clerk of the Criminal Court's Office. Lackawanna County Courthouse, Scranton, Pennsylvania.

Secondary and Published Sources

Brauer, Norman. *A History of Dalton, Pennsylvania*. Second edition. Dalton, Pennsylvania: Privately published, 1988.

_____. *The Northern Electric Railway*. Dalton, Pennsylvania: Privately published, 1989.

Commonwealth of Pennsylvania. *Historic Highwuy Bridges in Pennsylvania*. Harrisburg: Pennsylvania Historical and Museum Commission, 1986.

Condit, Carl W. *American Building Art, The Nineteenth Century*. New York: Oxford University Press, 1961.

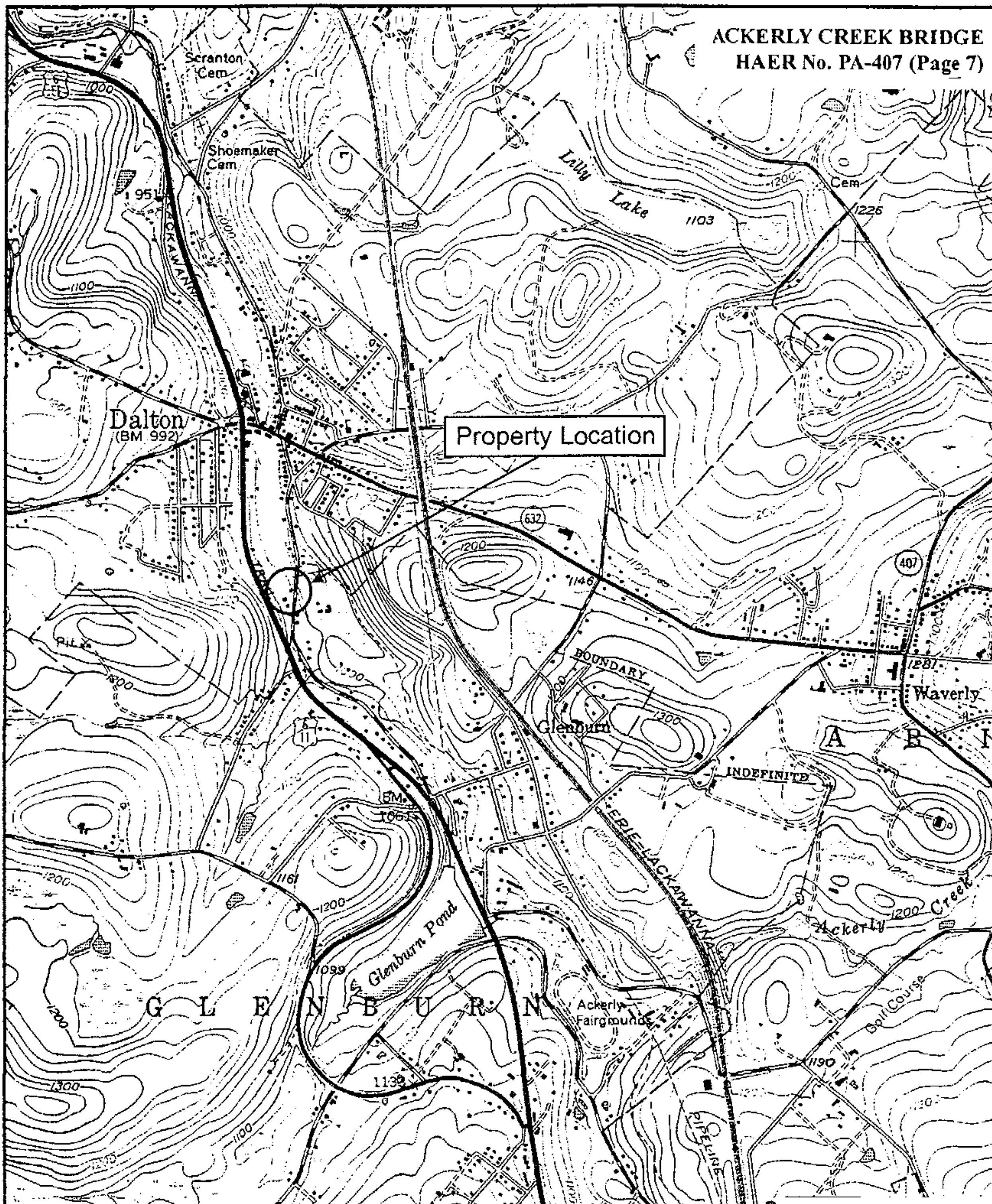
_____. *American Building Art, The Twentieth Century*. New York: Oxford University Press, 1961.

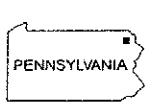
Jackson, Donald C. *Great American Bridges and Dams*. Washington, D.C.: Preservation Press of the National Trust for Historic Preservation, 1989.

Ketchum, Milo S. *The Design of Highway Bridges and the Calculation of Stresses in Bridge Types*. New York: Engineering News Publishing Company, 1908.

McCormac, Jack C. *Design of Reinforced Concrete*. New York: Harper and Row, 1978.

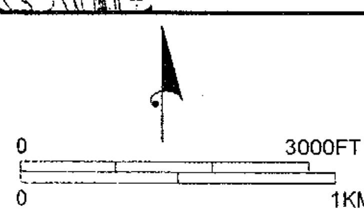
Schodek, Daniel L. *Landmarks in American Civil Engineering*. Cambridge, Massachusetts: MIT Press, 1987.

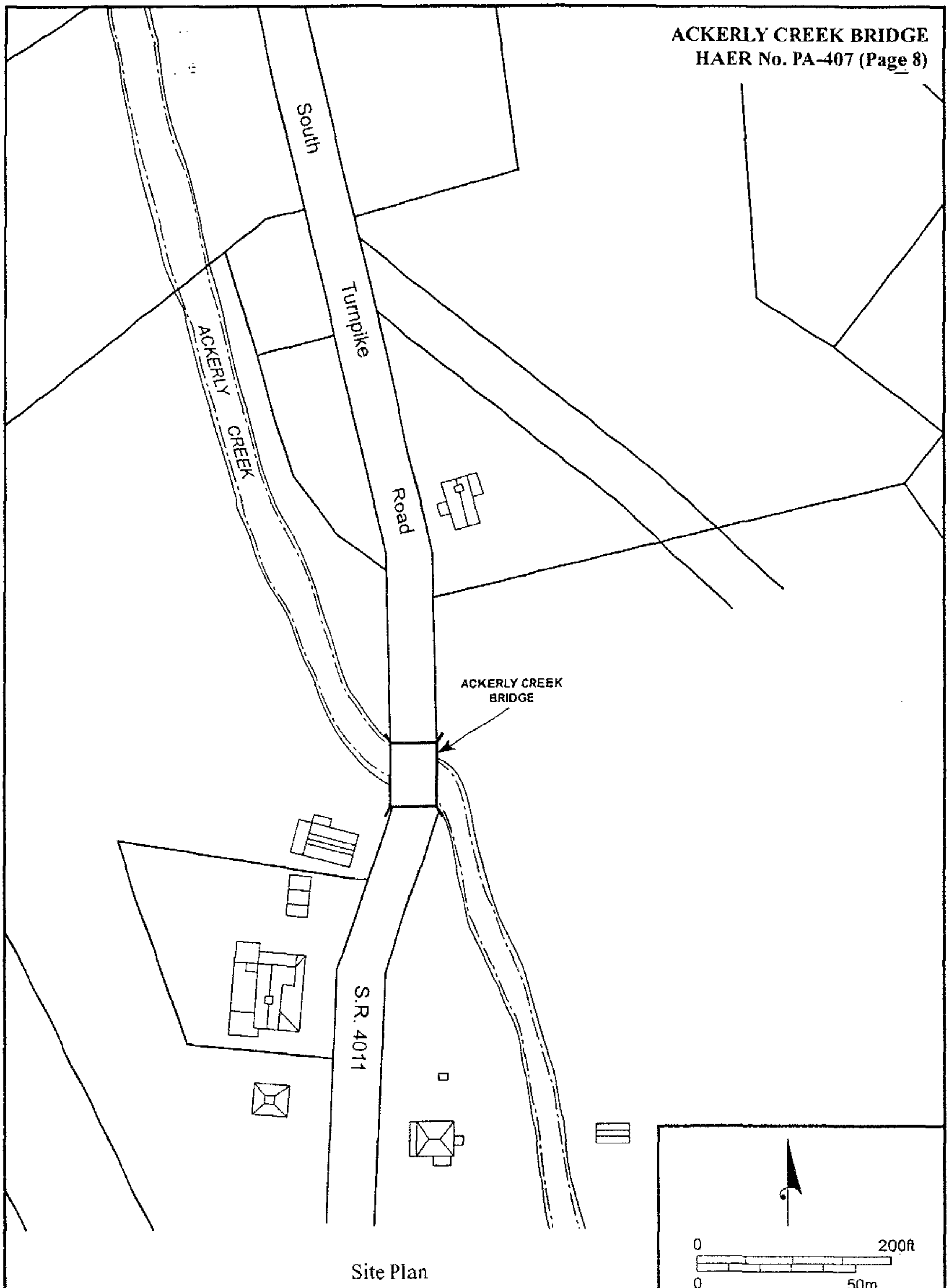




Quadrangle Location

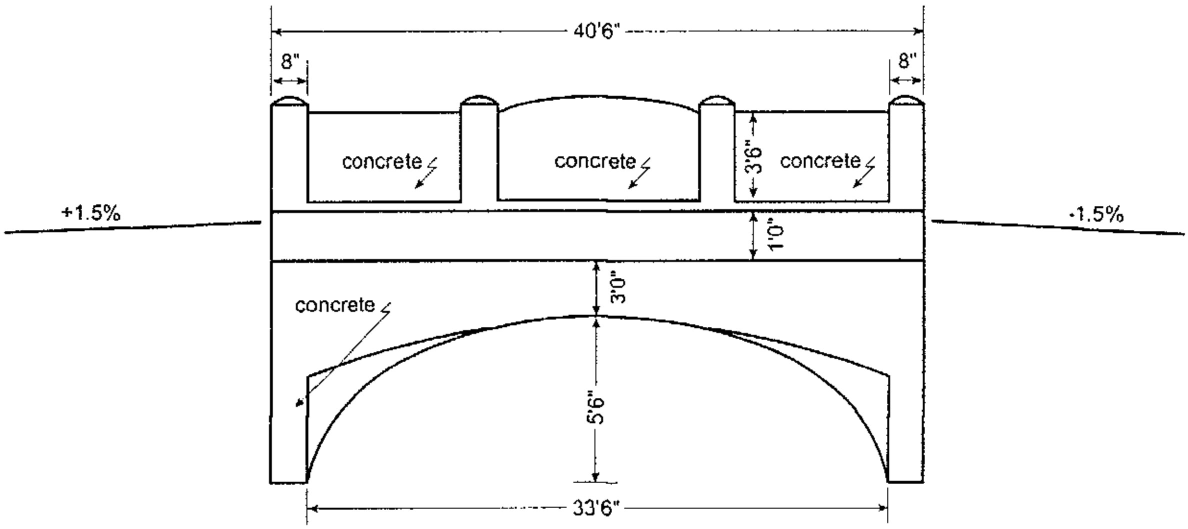
Property Location (Detail of
Dalton, PA. 7.5 Minute Quadrangle,
USGS 1946, Photorevised 1969)



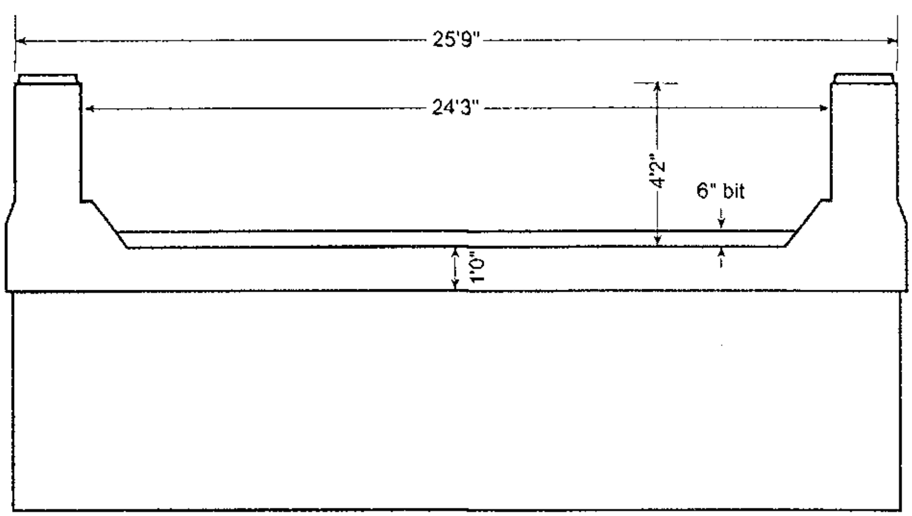

South
Turnpike
Road
ACKERLY
CREEK
ACKERLY CREEK
BRIDGE
S.R. 4011
0
200ft
0
50m

Site Plan

The existence of original drawings is unknown. The drawings presented below are adapted from sketches contained in maintenance files of the Pennsylvania Department of Transportation, Engineering District 4-0.



Elevation



Section